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Diagnosis and management of metanephric adenoma in pediatric patients

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Description

Metanephric Adenoma (MA) is a rare benign renal tumor that predominantly affects pediatric patients. Although generally considered benign, accurate diagnosis and appropriate management are crucial due to its potential for misinterpretation and the need to differentiate it from other renal neoplasms. Metanephric adenoma often presents as an incidental finding on imaging studies performed for unrelated reasons. In pediatric patients, symptoms are rare, and the tumor is usually discovered during routine physical examinations or imaging studies for unrelated conditions. When symptomatic, patients may present with nonspecific symptoms such as abdominal pain, hematuria, or a palpable abdominal mass. However, these symptoms are not specific to MA and can mimic other renal neoplasms or benign conditions.

Accurate diagnosis of metanephric adenoma relies on a combination of clinical, radiological, and histopathological findings. Imaging studies such as ultrasound, Computed Tomography (CT), and Magnetic Resonance Imaging (MRI) play a crucial role in characterizing renal masses and guiding further management. Metanephric adenoma typically appears as a well-defined, homogeneous, solid mass with minimal enhancement on contrast-enhanced imaging. However, imaging features may overlap with other renal tumors, making definitive diagnosis challenging. Histopathological examination remains the gold standard for diagnosing metanephric adenoma. Characteristic histological features include a uniform population of small, round to oval cells arranged in solid nests or tubules, with scant cytoplasm and low nuclear grade. Immunohistochemical staining is helpful in confirming the diagnosis, with positive staining for markers such as WT1, CD57, and CAM5.2, and negative staining for Cytokeratin 7 (CK7), CD10, and Epithelial Membrane Antigen (EMA). However, histological overlap with other renal tumors, such as Wilms tumor and clear cell sarcoma of the kidney, underscores the importance of expert pathological evaluation.

Metanephric adenoma must be distinguished from other renal neoplasms, particularly Wilms tumor, clear cell sarcoma of the kidney, and papillary renal cell carcinoma, which have different treatment approaches and prognoses. Wilms tumor, the most common pediatric renal tumor, typically presents with a triphasic histological pattern and may exhibit genetic alterations such as WT1 mutations and 11p13 deletions. Clear cell sarcomas of the kidney and papillary renal cell carcinoma have distinct histological features and genetic profiles, including EWSR1-ATF1 fusion and MET alterations, respectively. The management of metanephric adenoma in pediatric patients depends on factors such as tumor size, location, and patient age, as well as the presence of symptoms and associated comorbidities. Given its

benign nature and indolent clinical course, observation with serial imaging may be appropriate for small, asymptomatic tumors.

Metanephric adenoma is associated with an excellent prognosis, with rare reports of recurrence or metastasis following surgical resection. Long-term follow-up with regular imaging studies is recommended to monitor for tumor recurrence or growth. The risk of recurrence appears to be low, but long-term data on recurrence rates and outcomes in pediatric patients are limited. Multidisciplinary collaboration among urologists, pediatric oncologists, radiologists, and pathologists is essential for comprehensive patient care and optimal treatment outcomes. Surgical excision, either partial nephrectomy or nephron-sparing surgery, is indicated for symptomatic tumors, large lesions, or those with uncertain diagnosis. Minimally invasive approaches, such as laparoscopic or robotic-assisted surgery, offer advantages such as shorter hospital stays and faster recovery times.

Minimally invasive surgical approaches, including laparoscopic or robotic-assisted surgery, offer pediatric patients with metanephric adenoma the advantages of reduced postoperative pain, shorter hospital stays, and faster recovery times, leading to decreased morbidity and improved quality of life. Prompt diagnosis and surgical excision of symptomatic metanephric adenomas help prevent potential complications such as tumor enlargement, renal dysfunction, or compression of adjacent structures, thereby improving patient outcomes. Establishing a management plan for pediatric patients with metanephric adenoma allows for long-term monitoring and surveillance, facilitating early detection of tumor recurrence or growth and timely intervention if needed.

Conclusion

In conclusion, metanephric adenoma is a rare benign renal tumor that can occur in pediatric patients, posing challenges in diagnosis and management. While typically indolent and asymptomatic, accurate diagnosis is crucial to differentiate MA from other renal neoplasms and guide appropriate treatment. Multidisciplinary collaboration among healthcare professionals is essential for accurate diagnosis, individualized treatment planning, and long-term follow-up. Continued research efforts are needed to better understand the natural history, prognostic factors, and optimal management strategies for metanephric adenoma in pediatric patients.